



FACT SHEET



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SPACE-BASED LASER



BACKGROUND

One of the security challenges facing the world today is the proliferation of weapons of mass destruction (WMD) and the means to deliver them, including ballistic missiles. In recent years the world has seen a growing interest on the part of some States of Concern in acquiring ballistic missiles. Many have succeeded, and now are striving to develop or acquire more advanced, longer range systems.

Unfortunately, many of these nations have displayed hostile or antagonistic attitudes towards the United States and its allies. Thus, U.S. forward deployed forces, U.S. allies, and in the near future the U.S. itself, could be at the risk of ballistic missile attack. In response to these developments, the U.S. has undertaken broad measures to develop effective, reliable ballistic missile defense (BMD) systems.

The potential of intercepting and destroying a missile over enemy territory, soon after launch, rather than over friendly territory makes the development of a boost-phase intercept (BPI) capability very desirable. In concert with ground-based theater missile defense (TMD) and national missile defense (NMD) systems already under development, the U.S. continues to investigate BPI concepts for BMD systems.

Utilizing the most advanced technological capabilities currently available, the Space-Based Laser (SBL) Program is one promising avenue for missile defense being

explored by the Ballistic Missile Defense Organization (BMDO). Building on over 20 years of research and development into high-energy lasers (HELs), the SBL could develop the technology to provide the U.S. with a robust, global missile defense for engaging missiles during the boost-phase.

HELs AND MISSILE DEFENSE

Lasers have been investigated for their usefulness in air defense since 1973, when the Mid-Infrared Advanced Chemical Laser (MIRACL) was first tested against tactical missiles and drone aircraft. Research on such systems continued through the 1980s, with the Airborne Laser Laboratory, which completed the first test laser intercepts above the earth. Initial research on laser-based defense systems was overseen by the Defense Advanced Research Projects Agency (DARPA), but transferred to the newly created Strategic Defense Initiative Organization (SDIO) in 1984. Research continues today under the auspices of the BMDO, the successor to the SDIO in partnership with the United States Air Force (USAF).

The SBL program will build on a broad variety of technologies developed by the SDIO in the 1980s. The work on the Large Optics Demonstration Experiment (LODE), completed in 1987, provided scientists with the means to control the beams of large, high-powered lasers. The Large Advanced Mirror Program (LAMP) designed and built a 4 meter

HELs AND MISSILE DEFENSE [CONTINUED]

diameter space-designed mirror with the required optical figure and surface quality. In 1991, the Alpha laser (2.8 μm) developed by the SDIO achieved megawatt power at the requisite operating level in a low-pressure environment similar to space. Numerous Acquisition, Tracking, and Pointing/Fire Control (ATP/FC) experiments both completed and currently underway will provide the SBL platform with stable aimpoints. Successes in the field of ATP include advances in inertial reference, vibration isolation, and rapid retargeting/precision pointing (R2P2). In 1995 the Space Pointing Integrated Controls Experiment offered near weapons level results during testing.

THE SBL SYSTEM

An operational SBL platform achieves missile interception by focusing and maintaining the beam from a high-powered laser on a target until it achieves catastrophic destruction. Energy for the sustained laser burst is generated during the chemical formation of the hydrogen fluoride (HF) molecule. The HF molecules are created in an excited state from which the subsequent optical energy is drawn by an optical resonator with mirrors at both ends of the gain generator.

A 20 satellite constellation, operating at a 40° inclination could provide robust TMD threat negation capability. For this deployment, kill times per missile will range from 1 to 10 seconds, depending on the range from the missile. Retargeting times are calculated at as low as 0.5 seconds for new targets requiring small angle changes. It is estimated that a

THE SBL SYSTEM [CONTINUED]

constellation consisting of only 12 satellites can negate 94% of all missile threats in most theater threat scenarios. Thus a system consisting of 20 satellites could provide nearly full threat negation. A 24 satellite constellation, operating at a 60° inclination could provide NMD threat negation capability in addition to full TMD threat negation.

Concepts for an SBL are currently being investigated by the Air Force and BMDO. These concepts will provide guidance to the SBL/FFX project, and an on-orbit demonstration of an SBL concept, planned for the 2010-2012 timeframe.

THE BENEFITS OF SBL

"SBL offers the potential for a high leverage system to deal with ballistic missiles of virtually all ranges. The SBL appears to be by far the most effective boost-phase intercept system being developed by the Department of Defense."

*— 1997 Defense Authorization Act, Committee on Armed Services,
United States Senate*

The SBL program could develop the technology to provide the U.S. with an advanced and effective BMD system capable of both TMD and NMD missions. It would provide U.S. forces with a continuous, global boost-phase intercept capability. Finally, it would be out of reach to hostile Third World forces, thus making it a defensive capability difficult to eliminate.

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